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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/717,881

11/19/2003

Steven Gianoulakis

A8431/T51500

9363

57385

7590

04/03/2007

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EXAMINER

LUND, JEFFRIE ROBERT

ART UNIT

PAPER NUMBER

1763

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

04/03/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/717,881

Applicant(s)

GIANOULAKIS ET AL.

Examiner

Jeffrie R. Lund

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5-12 and 36-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5-12,36-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 5-9, 11, 36-41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fischer US Patent 5,422,139.

Fischer teaches a processing apparatus that includes: walls enclosing a process chamber 14; a susceptor for supporting a wafer (substrate) 10; a first/second exhaust conduit 18 radially outward from the wafer susceptor in fluid communication with the chamber and adapted to receive a first/second flow of gas passing substantially vertically from a gas distribution showerhead to an upper surface of the wafer and radially across the upper surface of the wafer to the first/second exhaust conduit; and a processing gas source A in fluid communication with the chamber through a showerhead 13, which includes a first channel 12 in fluid communication with the processing gas source and with apertures 3, 4 distributed over the lower surface of the showerhead, and a second/first channel separate from the first/second channel and in fluid communication with a second/first exhaust conduit and with exhaust apertures 5 distributed over the lower surface of the showerhead wherein the second/first exhaust conduit is adapted to receive a second/first flow of gas passing substantially vertically from the first channel apertures 3, 4 to an upper surface of the wafer and substantially

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vertically through the second channel apertures 5, the second/first flow of gas being independent of the first/second flow of gas; and the first exhaust conduit and the second exhaust conduit share a common exhaust line 22 and pump. The apertures define a first area and the exhaust apertures define a second area and the ratio of the first area to the second area is substantially constant as a function of radial distance from the center of the gas distribution showerhead. (Entire document, specifically, figures 3a-3d)

Fischer differs from the present in that Fischer does not teach that the ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution showerhead.

Optimizing the size of the apertures of a showerhead is required in order to optimize the flow in the process chamber, and for each process in which the showerhead is used. It would be obvious to one of ordinary skill to vary the ratio of the first area to the second area as a function of the radial distance from the center of the gas distribution showerhead in order to optimize the flow of the process gas into and out of the chamber. Furthermore, it was held in *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), by the Federal Circuit that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. (Also see MPEP 2144.04 (d))

Therefore it would have been obvious to one of ordinary skill in the art at the time

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the invention was made to vary the ratio of the first area to the second area as a function of the radial distance from the center of the gas distribution showerhead in order to optimize the flow through the processing chamber of Fischer.

3. Claims 10, 12, 42, and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fischer, US Patent 5,422,139, in view of Adomaitis et al, WO 02/08487.

Fischer was discussed above.

Fischer differs from the present in that Fischer does not teach valves in the first and second conduits are connected to the common foreline via a first and second valve, or that the first and second conduits are connected to separate vacuum pumps.

Adomaitis et al teaches a processing apparatus that includes: walls enclosing a process chamber 10; a susceptor 18 for supporting a wafer 16; a first exhaust conduit is connected to a gate valve 20, V1CV1 in fluid communication with the chamber; a processing gas source 21 in fluid communication with the chamber through a showerhead 12, which includes a first channel 26 in fluid communication with the processing gas source and with apertures 30 distributed over the lower surface of the showerhead, and a second channel 34, separate from the first channel, and in fluid communication with a second exhaust conduit 35, a valve V2CV2, and with exhaust apertures 32 distributed over the lower surface of the showerhead; the first exhaust conduit is connected to a first pump; and the second exhaust conduit is connected to a second pump (figure 11). The apertures define a first area and the exhaust apertures define a second area and the ratio of the first area to the second area is substantially

constant as a function of radial distance from the center of the gas distribution showerhead. (Entire document, specifically, figures 3a-3c, 4-7, and 11)

The motivation for adding the valves of Adomaitis et al to the first and second exhaust conduits of Fischer is to control the flow of gases through the exhaust conduits.

The motivation for replacing the single pump of Fischer with two pumps as taught by Adomaitis et al is to provide an alternate and equivalent means of exhausting the process gases. Multiple pumps allow the pumps to be specifically tailored to the flow requirements of each flow conduit.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add valves to the first and second exhaust conduits of Fischer, and replace the single pump of Fischer with two pumps as taught by Adomaitis et al.

4. Claims 1, 5-9, 11, 36-41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fischer, US Patent 5,422,139 in view of Muller et al, US Patent 6,537,418.

Fischer teaches a processing apparatus that includes: walls enclosing a process chamber 14; a susceptor for supporting a wafer (substrate) 10; a first/second exhaust conduit 18 radially outward from the wafer susceptor in fluid communication with the chamber and adapted to receive a first/second flow of gas passing substantially vertically from a gas distribution showerhead to an upper surface of the wafer and radially across the upper surface of the wafer to the first/second exhaust conduit; and a processing gas source A in fluid communication with the chamber through a

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showerhead 13, which includes a first channel 12 in fluid communication with the processing gas source and with apertures 3, 4 distributed over the lower surface of the showerhead, and a second/first channel separate from the first/second channel and in fluid communication with a second/first exhaust conduit and with exhaust apertures 5 distributed over the lower surface of the showerhead wherein the second/first exhaust conduit is adapted to receive a second/first flow of gas passing substantially vertically from the first channel apertures 3, 4 to an upper surface of the wafer and substantially vertically through the second channel apertures 5, the second/first flow of gas being independent of the first/second flow of gas; and the first exhaust conduit and the second exhaust conduit share a common exhaust line 22 and pump. The apertures define a first area and the exhaust apertures define a second area and the ratio of the first area to the second area is substantially constant as a function of radial distance from the center of the gas distribution showerhead. (Entire document, specifically, figures 3a-3d)

Fischer differs from the present in that Fischer does not teach that the ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution showerhead.

Muller et al teaches a gas distribution plate 60 that includes a first channel 72 in fluid communication with the processing gas source and with apertures 66, 66a distributed over a lower surface of the gas distribution plate, the apertures define a first area; and a second channel separate from the first channel and in fluid communication with a second exhaust conduit and with exhaust apertures 69, 69a distributed over the lower surface of the gas distribution plate. The second apertures 69, 69a define a

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second area and a ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution plate. (The ratio 66/69 at the center decreases as the radial distance increase from the center to the ratio 66a/69a at the edge of the wafer.) Muller et al also teaches:

“It is further contemplated that apertures 66 and channels 69 can have predetermined areas at predetermined locations on GDP 60 to adjust the flow at to accommodate different load conditions on the wafer. By creating a condition in which load conditions are accounted for in conjunction with uniform gas concentrations, an improved etching process is realized.”

The motivation for varying the ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution showerhead of Fischer as taught by Muller et al is to optimize the flow at to accommodate different loads conditions on the wafer to improved the etching process. Furthermore, it was held in *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), by the Federal Circuit that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. (Also see MPEP 2144.04 (d))

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the ratio of the first area to the second area as a function of the radial distance from the center of the gas distribution showerhead in

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order to optimize the flow through the processing chamber of Fischer as taught by Muller et al.

5. Claims 10, 12, 42, and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fischer, US Patent 5,422,139, and Muller et al, US Patent 6,537,418 B1, as applied to claims 1, 5-9, 11, 36-41, and 43 above, and further in view of Adomaitis et al, WO 02/08487.

Fischer and Muller et al differs from the present in that they do not teach valves in the first and second conduits are connected to the common foreline via a first and second valve, or that the first and second conduits are connected to separate vacuum pumps.

Adomaitis et al was discussed above.

The motivation for adding the valves of Adomaitis et al to the first and second exhaust conduits of Fischer is to control the flow of gases through the exhaust conduits.

The motivation for replacing the single pump of Fischer and Muller et al with two pumps as taught by Adomaitis et al is to provide an alternate and equivalent means of exhausting the process gases. Multiple pumps allow the pumps to be specifically tailored to the flow requirements of each flow conduit.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add valves to the first and second exhaust conduits of Fischer and Muller et al, and replace the single pump of Fischer and Muller et al with two pumps as taught by Adomaitis et al.

Response to Arguments

6. Applicant's arguments, see pages 6-8, filed January 2, 2007, with respect to the rejections of claims 1, 5-12 under 103 in view of Williams, Muller et al, and Adomaitis et al have been fully considered and are persuasive. Therefore, the rejections have been withdrawn. However, upon further consideration, new grounds of rejection is made in view of Fischer, Muller et al, and Adomaitis et al as discussed above.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

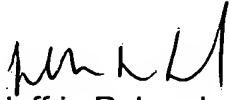
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (10:00 am - 9:00

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pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Jeffrie R. Lund
Primary Examiner
Art Unit 1763

JRL
3/30/07